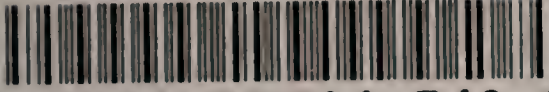


BOSTON PUBLIC LIBRARY



3 9999 08714 540 3



# Inquirer and Mirror.

NANTUCKET.

SATURDAY, DECEMBER 25, 1875.

## Miscellaneous Reading.

### Survey of Nantucket Harbor Bar.

We are indebted to Collector Hiller, for a copy of the annual report upon the improvement in rivers and harbors, from which we copy that part of the report of Mr. H. S. Van Ingen relating to the survey of Nantucket Harbor Bar and the Haulover Beach, made with a view to determine the practicability of increasing the facility of entering Nantucket Harbor, and of making it a place of refuge for coasters during unfavorable winds.

ENGINEER DEPARTMENT, U. S. ARMY, }  
Newport, R. I., November 24, 1874. }

GENERAL: I have the honor to present the following report, with map, of the survey of Nantucket Harbor Bar, Massachusetts.

In accordance with your verbal instructions I proceeded to Nantucket August 18, on the completion of the survey of Edgartown Harbor, Messrs. Mather and Eayrs, assistants, following me the next day. As the object of the survey was not definitely stated in the appropriation act, my first business was to learn from residents the ends sought and the interests which had secured the ordering of the survey. After considerable difficulty I obtained, through Mr. Joseph B. Macy, of Nantucket, the petition which accompanies this report, said to have been signed by most of the business men of the town. From this it appears that the intent of those who influenced the passage of this bill was to have a channel opened through the Haulover Beach, at the head of the harbor, for the double purpose of making the upper harbor one of refuge for coasters, and of deepening the channel through the bars by the additional scour that it was thought would be produced by the opening of an eastern entrance.

It was therefore deemed necessary to make a survey, or examination, both of the Haulover Beach and of the bars and channel at the present entrance to Nantucket Harbor. This was done in as much detail as the limited appropriation of \$500 would allow, and the map of survey accompanies this report. At the Haulover numerous borings, 6½ feet deep on the eastern shore, and 11 feet deep on the west shore, below low-water, were made, and the material found to be almost entirely fine sand; at certain points a thin layer of gravel was encountered on the east side, but no hardpan, as had been thought probable by some persons; this is said to be found about a quarter of a mile south, near the shore. Tidal observations were made for a few days, both inside and outside the beach, but the sea outside was so high part of the time, and a gale of four days' continuance, the survey was not completed until August 31. I returned to Newport the next day.

\* \* \* \* \*

Nantucket Island is situated in the centre of several active natural forces. The island itself is composed of drift and alluvial deposit, the sands of which are constantly shifting. The currents are swift and changeable, on account of the two derivations of the tide which reach its shores. From the south comes the main ocean tide, sweeping along the south shore of Martha's Vineyard, carrying with it great quantities of sand. Part of this tide passes through Muskeget Channel and along the north shore of Nantucket Island, depositing its sand to form the shoals there; those at the entrance to Nantucket were thus formed. The rest of the south tide moves along the south shore of Nantucket, round its southeast corner at Siasconset, and passes up the east side toward Great Point. On its way thither it meets the northeast tide, which is simply a portion of the great south tide retarded by the shoals off this coast and driven around to the northward, striking Nantucket Island about four hours after the other. The ebb-current takes part of this sand from the south side to form the shoals, and the flood-current drives part inside Great Point and down toward Nantucket Harbor. The numerous narrow beaches, shoals, and sand-spits of this island indicate the movement of the tidal currents.

Nantucket Harbor proper has an anchorage-ground, inside Brant Point, of 48 acres 12 feet deep and 750 acres 9 feet deep. The entrance, however, is so blocked by bars extending for nearly two miles from shore that the harbor is of little avail. About 5½ feet can be carried in at low-water and 8½ feet at high-water, mean tides, if vessels keep in the narrow slues; a slight deviation to one side or the other diminishes the depth. This, therefore, excludes all but the lightest class of vessels, and necessitates the employment of experienced pilots, an expense which, often repeated, coasters could ill-afford.

The harbor inside of Brant Point stretches out to the eastward into a long bay, terminated five and a half miles from town by Haulover Beach, a strip of sand

about 450 feet wide at low-water mark; its crest is 17½ feet at highest part, and 10½ feet in slues, above mean low-water. Much of this upper harbor, as it is called, is very shoal, with a narrow, tortuous channel, and this obstructed by some rocks. Pocomo Head, on the south side, extends its point far across the bay, while just east of it, on the north side, Bass Point sends out a bar, with 2 feet at mean low-water, to the opposite shore. These points, by their lapping, make the channel-way very crooked. They are composed of compact sand and gravel. On passing these, we open into a broad bay, called the "Head of the Harbor," affording an anchorage, if attainable, of 5,000 acres 12 feet deep. This it is desired to make available by cutting an entrance through the Haulover Beach.

Mr. Van Ingen here gives extracts from the reports of Lieuts. Totten and Prescott, of surveys made by them in 1827 and 1829, which we omit. He then goes on to say:

During 1872-'73, the Coast Survey Department made surveys of Nantucket Harbor, inside of Brant Point and up to Haulover Beach, with a view to an opening through the latter. Professor Mitchell, in his report on the season's work of 1871, is in favor of making a cut through the beach to create a circulation through the harbor in order to deepen the bars at its entrance. He re-asserts an opinion made by him fifteen years before, that "all the advantages which the harbor of Edgartown possesses over that of Nantucket would seem to be due to the existence of a southern opening in the former case."

This is what had been done toward the improvement of this harbor up to the time when the subject was given you for consideration. It is so similar to that upon which you reported last year, "Improvement of Edgartown Harbor," that a lengthy discussion of causes seems unnecessary, and therefore only those points wherein it differs from that will be treated here.

The two obstructions to this harbor, the bars at the entrance and the Haulover Beach, are in reality the same in kind, but different in degree, due to similar causes still at work, and in case of removal subject to the same tendencies to be replaced. For convenience they will be considered separately.

#### I.—THE REMOVAL OF THE BARS AT THE PRESENT ENTRANCE.

From comparison with the oldest maps and reports on the subject, and from conversation with the best pilots of the place, it is known that these bars are subject to little change. The depth on them now is the same as in 1829, though the channel may have since shifted several times. Neither does Coatue Flat, which Lieutenant Prescott stated was formed in the fifteen years preceding 1829, seem to have changed materially, though there seem to be indications of increased shoaling oppo-

depth on the bars was the same in those prosperous days, and needs explanation. The whalers, when light, could rarely cross the bars unaided, and were usually carried over them on "camels;" the loading and unloading during the summer months were done outside the bars, and in winter at Edgartown, with which place Nantucket was connected by lighters. The hardy men of those days were not stopped by sand-bars.

As would be expected from the movement of the sand along the shore, the channel gradually moves eastward for a certain length of time, then beginning to fill up, another opens to the west, a movement similar to that of the openings through the South Beach, at Edgartown. The distance traversed, however, is not great. The channel, at present buoyed out and ranged by lights, seems to be inferior to that farther east, which is now being used by the best pilots. Any new channel, therefore, though dug into the clay, would probably fill up in a similar manner with sand, while the new one, breaking out to the west, would take the present depth. The forces at work removing and supplying sand, seem to have long been, and to now be, in very exact equilibrium. The dredging of a narrow channel through this vast sand-barrier would certainly be insufficient to destroy it. However, to cover the whole subject, there is given below an estimate of the cost of making a channel through these bars and flats, so as to allow vessels drawing 12 feet

to enter the harbor at low-water. Two hundred feet is the least width that could be allowed, and this would not permit vessels to beat in, and would therefore much limit the advantages of the harbor as one of refuge.

Dredging of 292,346 cubic yards sand and clay, at 25 cents per yard.....	\$73,086 50
Engineering expenses and contingencies....	7,308 65

Total cost.....	80,395 15
-----------------	-----------

To even temporary success is essential what was insisted upon by Lieutenant Prescott, the completion of the work in one year.

#### II.—THE CUTTING OF AN OPENING THROUGH HAULOVER.

Several reasons are given by different parties in favor of this. The Coast Survey Department desires it mainly for its effect on the bars just referred to. Through Professor Mitchell, also, they sum up the advantages as follows: "There are few cases where a community has less to lose from the failure, or more to gain by the success of an experiment. A passage way through the beach would build up the fishing-interests of the place. It would also be an avenue for pilots carrying hope and assistance to vessels bewildered among the shoals, and for life-boats on errands of mercy.

The advisory board of Boston harbor commissioners, of which the gentleman just quoted is a member, in their report of 1872, referred to this subject as follows:

"This experiment we hope to see tried; and while we should expect no great effect upon the bar at the main entrance, even if the opening at the Haulover should be main-

The fact that Nantucket was once a great whaling port may seem to be inconsistent with the statement just made, that the

tained, we can anticipate only benefits. \*

\* \* We repeat that the experiment at the Haulover is worth an earnest trial, and that some benefit elsewhere, but no injury anywhere, may be anticipated."

Mr. Macy, the leader of the Nantucket petitioners, stated to me another advantage to be gained. He would make the bay called the "Head of the Harbor" a port of refuge for coasters to take the place of Vineyard Haven and Edgartown; and would also make it the main entrance to the wharves at Nantucket by dredging a channel through the shoals at Bass Point, Pocomo Head, &c. This increases the project, though making it more important.

Assuming that this plan is to be carried out to secure all the ends sought, the following would have to be the course of procedure: The channel from Brant Point up the harbor must be deepened to six feet at low-water, to allow vessels with materials, tools, &c., to reach the beach; a wharf must be built on the inside of the beach, on which to land stone and other material; the surface-sand from the beach down to low-water level must be removed over a width of 200 feet at least; a jetty must be built south of the proposed cut, to hold back the littoral sand until the new channel shall have become strong enough to hold its own; a cut 100 feet wide and 6 feet deep below low-water must be dredged through the beach, (this is the least width that could be given, reliance being placed on the scour deepening and widening it;) and finally a channel 12 feet deep at low-water must be secured to the Nantucket wharves.

To accomplish this, the following estimate is made, based in part on the similar work done at Edgartown in 1873:

1st. *To simply secure an opening through the beach.*

To secure a 6-foot deep channel from Nantucket to the beach by dredging, 53,091 cubic yds sand and gravel, at 20 cents,	\$10,616 20
Removal of surface-sand from the beach down to low-water level over a width of 200 feet, by means of scrapers and cars running on tracks east of the proposed cut, so as to dump into the ocean, including cost of track, &c., 27,736 cubic yards, at 30 cts.	8,320 80
Dredging a cut 100 feet wide and 6 feet deep below low water, and dumping the material on one side of the harbor, 28,815 cubic yards of sand, at 20 cents,	5,363 00
Buildings for men, animals, and tools,	2,000 00
Temporary wharf, 80 feet long,	400 00
Jetty, 143 feet long, running out to 9 feet of water, 8 feet high above high-water, of triangular section, slope of 45°, stones to be in blocks of $\frac{1}{4}$ ton to 2 tons in weight, 361 tons of stone, at \$3.50, delivered at the beach,	1,264 50
Transportation across the beach and placing them in the jetty,	300 00
Contingencies and engineering expenses,	3,735 50
	<hr/>
	\$32,000 00

2d. *To secure a 12-foot deep channel from the beach to Nantucket.*

Dredging of 284,410 cubic yards of sand and gravel, at 20 cents,	\$56,882 00
Contingencies and engineering expenses,	6,118 00
	<hr/>
	63,000 00

Total cost of whole improvement, 95,000 00

The men employed on the work would have to be boarded near the beach, and

buildings for their accommodation and that of the animals would probably have to be erected in the neighborhood; an estimate for these is included in the above.

That an opening could be made in this way there is little doubt, provided no unusually severe storm should come at the very close of the work. The difficulties to be encountered are less than at the South Beach, Edgartown. There the beach itself is lined with shoals a few hundred feet off, much more sand is moving, and the beach is more exposed to worse storms than at Nantucket. Cotamy Bay inside is also very shoal for some distance. At the Haulover, on the other hand, there is deep water inside and out, not much littoral sand comparatively, and the waves not as large nor as wearing as at Edgartown. There would, then, be good chance of making an opening, but would it widen itself and continue to exist? Here the contrast with Edgartown is not so favorable. The difference of level inside and out at the Haulover is not as large as at Cotamy Beach, on account of the northeast tide being the dominant one on both sides of the beach. The maximum difference of level, according to Professor Mitchell, is over 1 foot, lasting alternately three to four hours. There follow two sets of curves, taken during the survey, as examples of actual tides. Professor Mitchell's are average results, as he had only records at remote stations from which to calculate them. The first agrees quite closely with Professor Mitchell's curves, while the other shows what might be expected at certain times, and indicates the greatest danger to the channel. A head of one foot, if continuous either way, would of course be sufficient; but unfortunately there would be hours each day when the level inside and out would be the same. During this time the littoral sand would be deposited rapidly in the cut, as soon as it had filled out the beach south of the jetty to its outer end, and shoals would form in it; the next current would, according to direction, carry a portion of this in or out, in amount depending on velocity. Professor Mitchell says on this point: "The movement into the basin from outside will exceed in velocity that which, six hours later, will obtain in the opposite direction, so that an interior accumulation of sand will be likely to occur as well as a bar outside. The basin of the upper harbor is, however, deeper than any other part of the port, and not, as now, used for commercial purposes." It seems probable, therefore, that unless the jetty should be carried out every year as fast as the shore makes south of it, the cut would be sure to fill up; it is doubtful if this would not be the sequel in any event.

As bearing on this point, allow me to state two marked differences between the Haulover Beach and South Beach, Edgartown. Since the time when the upper harbor ceased to be a fiord, and the beach shut off direct communication with the ocean, there has never been an opening made by nature through it, nor any apparent change of form, as far as the memory of man or tradition goes back. There

now numerous slues about 10 feet above low-water, through which the ocean waves frequently run in severe storms; but there is never any return flow.

Outside of this beach, also, the currents are less rapid than either north or south; in fact, it seems to be almost a slack-water region for a large part of the time. So light, indeed, are the tidal currents as frequently not to straighten out the fishermen's nets. At Edgartown, on the contrary, though the beach is much wider, natural openings have frequently broken through in past years. These have usually occurred at parts of the beach where the current was comparatively light, (though rapid compared with that outside the Haulover,) but they have at once begun to move eastward until they reach the swifter currents at Wasque Point, where they have stood the longest.

Having reached this conclusion, that the beach might be cut through, but that the opening would almost certainly close, assume that it remains open; what will be the real advantages, and how commensurate with the cost? And, finally, could not the only end sought, worthy of consideration, be better reached otherwise?

First, as to the object most frequently mentioned, the deepening of the channel over the bars. On this point it cannot certainly be said that the opening of a channel through Haulover Beach will not have this effect, but there seems a strong probability against it. The ebb-tide now runs past Brant Point so rapidly that a boat can scarcely be rowed against it at times, with such velocity as to scour 35 feet deep, but only for a short distance. The additional scouring power due to the proposed cut would probably expend itself in lengthening this deep hole a short distance \* \* \* \* Part of the additional volume of water would run out close to Coatue Point, and deepen that exit, while the clay-bars out from shore would still remain as before, the extra velocity attained being dissipated by diffusion before reaching them. The channel dredged, being still so much narrower than either of the natural depressions, would be impotent. It must be remembered, too, that the flood-current carrying sand into the harbor will be nearly as great as the ebb, so that the harbor will act as a catch-hole for the material brought from the shoal ground by either tidal current. Again, though the opening through the soft sands of the beach should widen itself, its section would be limited by that at Bass Point and Pocomo Head. The material at these bars is very hard, and would not easily be worn away. The tide connecting the "Head of the Harbor" with the main harbor across these points is now so rapid as to necessitate a good wind for a boat to stem it, and still it has not deepened them. These obstructions, though a narrow channel should be dredged through them, would still be a barrier to the current from the ocean, destined to deepen the bars at the entrance. Notice, then, the course of this current before reaching the point for which it was intended. Passing through the opening into the wide and deep bay, it becomes at once

greatly diffused, dropping its sand in a bar at the mouth, then passes on over the bars, at the points named above, on through the narrow channel, cutting away sand-spits and rolling along the sand until it deposits it in the deep water of the harbor; the current now divides, part striking across to the southeast corner of the harbor, and thence out around Brant Point, the other moves directly out, mainly past Brant Point, but partly close the Coatue Point. The main division of the tidal current is the cause of a large shoal near the middle of the main harbor, shown on the Coast Survey chart. The reunited currents passing Brant Point become greatly diffused, seeking out the different gullies of the bars, and gradually sweeping around to the northeast to join the ebb-tide of the sound, and out past Great Point. This latter is the movement that would fill in any cut dredged. The return-tide would be simply the reverse of the former, doing as much injury as benefit. It is unnecessary to discuss this longer; the difficulties and probabilities are apparent.

But though the above end should not be accomplished, assume that we still have an eastern entrance to Nantucket Harbor; what would be its value, and what the value of the "Head of the Harbor" as a port of refuge? In summer it would be available for both, and especially to coasters, as the only head wind in entering the cut would be one about south-west, which would be just the one to take them over the shoals. As soon as that came, they could run out with free sheets and over the shoals. The passage to the wharves, however, could seldom be made by sail. In winter, coasters would prefer to avoid this exposed shore in easterly storms and the occasional shoals which lie off it. At that season, too, when there is the greatest detention, the harbor would often be full of ice, and of no avail, either for refuge, or as an entrance to Nantucket.

There certainly is no local reason that would warrant the expenditure of the sum named for the improvement of Nantucket Harbor. There seems to be little unity of opinion among the residents as to the desirableness of the opening of the beach. Of those with whom I conversed, about as many feared injury to the bars and harbor as benefit. The owners of Coskata Farm, south of Great Point, are strongly opposed to being cut off from land-communication with Nantucket. While this would be a minor objection to a great improvement, as the damages for which they would receive compensation would be slight, still it is worthy of consideration in making an experiment so doubtful of successful issue.

The subject of harbors of refuge along this coast is a more important one, and, unfortunately, one which has been examined only with reference to particular cases. The sole object is to accommodate the coasting-trade around Cape Cod, the time consumed in which trip is so much increased by the shoals off Monomoy Point. At present there is no convenient harbor between Newport and Provincetown. To afford one has been the end sought in the various improvements projected at Block

Island, Cuttyhunk, Vineyard Haven, Edgartown, Hyannis, Great Point, and now at Nantucket. Each in succession has been considered the best by its proposer, and each has had certain claims; but they have always been considered singly. Block Island will be valuable when finished, saving the narrow, out-of-the-way passage to Newport; Cuttyhunk would have answered the same purpose, but given less local benefit; Vineyard Haven is easy of access, but not large enough, nor thoroughly protected; Edgartown is still smaller, and not as easy of access as the preceding; Hyannis is small and out of the way. The project for a breakwater at Great Point is admirable, but too expensive. All of these, except the last, are too far distant to offer refuge to vessels detained by the shoals. Nantucket, in this respect, but in no other, has advantages over them all. Her present harbor, however, if opened, would not accommodate a tithe of the vessels that would seek admission. But if even there existed good, safe harbors in this vicinity, the delay occasioned by the shoals would still continue. To remove these is, of course, impracticable; there only remains to seek some other passage. This has already been partially considered in the project for cutting a canal through Cape Cod, at the head of Buzzard's Bay. This would afford a safe and quick passage to the vast coasting-trade, and would render unnecessary a harbor of refuge east of the one now in progress at Block Island, and would save the expense now annually being incurred in experimental improvements which do not alleviate the main trouble. As the proposed improvement on Nantucket Harbor is of this kind, I have gone a little out of my way to briefly draw your attention to its connection with the main subject of facilitating the water-transportation between New York and Boston and other eastern ports.

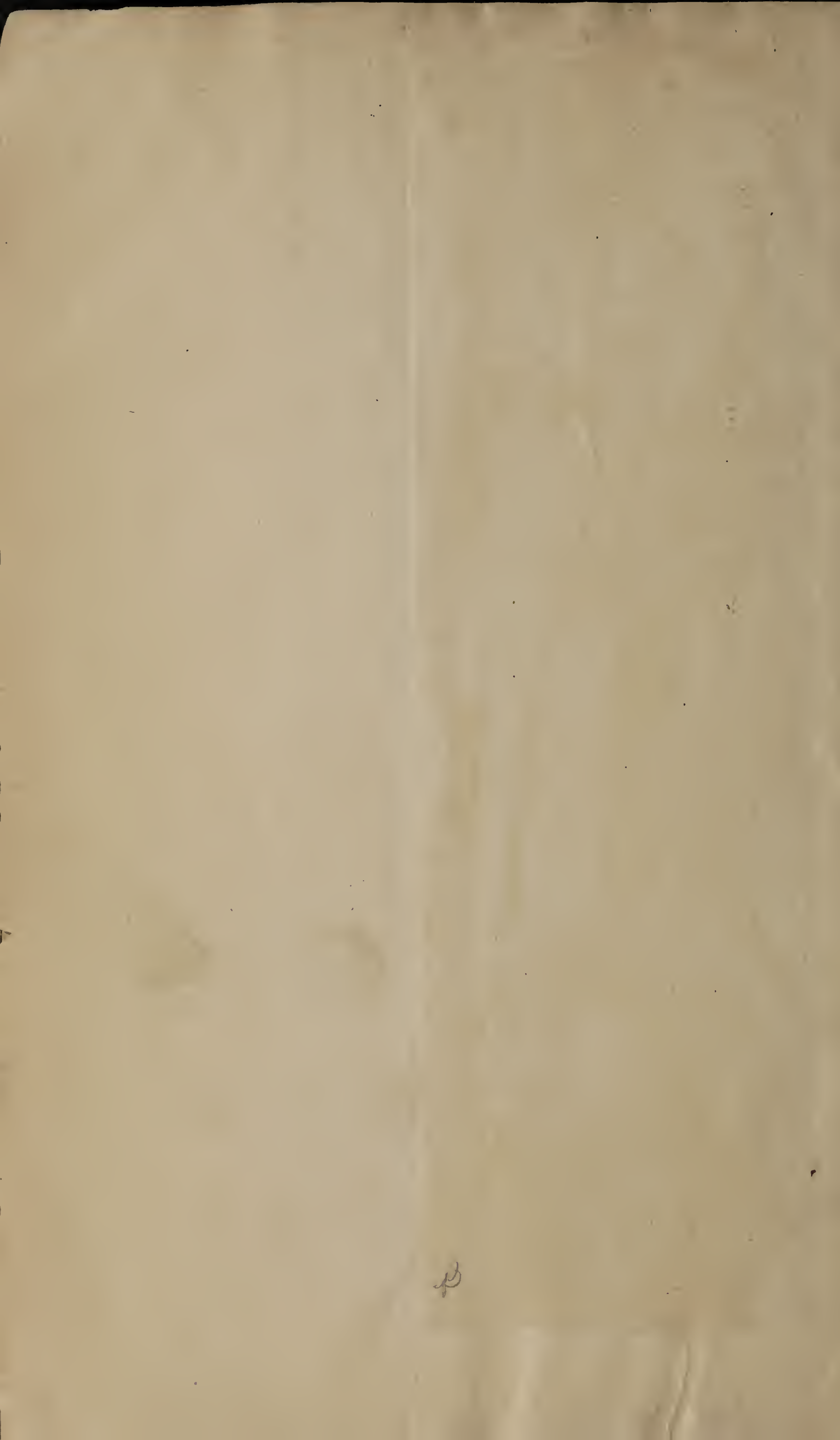
There accompanies this report a map, in one sheet, of Nantucket Harbor Bar, Massachusetts, and the Haulover Beach at its narrowest part, on a scale of 1-2400, with cross-sections through the beach; also one United States Coast Survey chart, scale 1-80000, showing the general locality of Nantucket, and the relation of the different parts of the map of survey.

I was ably assisted throughout the survey by Messrs. C. R. Mather, civil engineer, and N. W. Eayrs, civil engineer, who executed the instrument-work. I am also indebted to Messrs. James Codd, collector, Joseph B. Macy, and others, residents of Nantucket, for information furnished by them.

Very respectfully,

H. S. VAN INGEN,  
*Civil Engineer.*

General G. K. WARREN,  
*Major of Engineers, U. S. A.*

















FEB 24 1981

